PB89-206361

Superfund Record of Decision (EPA Region 3): Berks Sand Pit Site, Longswamp Township, Berks County, Pennsylvania (First Remedial Action) September 1988

(U.S.) Environmental Protection Agency, Washington, DC

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EPA/ROD/R03-88/060
September 1988

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EPA

Superfund Record of Decision:

Berks Sand Pit, PA

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15. Supplementary Notes

16. Abstract (Limit: 200 words)

The three to four-acre Berks Sand Pit site is located in Longswamp Township, Berks County, Pennsylvania. There are at least 20 single family homes within the investigation area, including one on top of the actual sand pit. The immediate vicinity of the site is zoned for low density residential use. The Berks Sand Pit was created by the removal of sand and gravel, but reportedly was used by area residents for refuse disposal. Industrial waste also was alleged to have been disposed of in the area around the pit. Houses were constructed and private wells installed at the location beginning in 1978, after the pit was backfilled. The site first came to the attention of EPA in January 1982 when area residents detected ground water contamination. Emergency actions were undertaken by EPA in the summer of 1983. The pit was partially excavated and backfilled with clean fill, but no pocket of contamination was discovered. The primary contaminants of concern affecting the ground water, surface water, and sediments are VOCs including 1,1,1-TCA, 1,1-DCA, PCE, and 1,1-DCE.

The selected remedial action for this site includes: excavation of contaminated sediments with offsite treatment by incineration; ground water pump and treatment using air stripping and vapor phase carbon absorption with reinjection of treated water back

(See Attached Sheet)

17. Document Analysis a. Descriptors

Record of Decision
Berks Sand Pit, PA
First Remedial Action - Final
Contaminated Media: gw, sw, sediments
Key Contaminants: VOCs (1,1,1-TCA, 1,1-DCA, 1,1-DCE, PCE)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 38
	20. Security Class (This Page) None	22. Price

EPA/ROD/R03-88/060
Berks Sand Pit, PA
First Remedial Action - Final

16. ABSTRACT (continued)

into the aquifer; provision of an alternate water supply system, surface and ground water monitoring; and restrictions to prevent installation of drinking water wells in the contaminated acquifer. The estimated present worth cost for this remedy is $10,773,100, with annual O&M costs of $459,200.

RECORD OF DECISION

Berks Sand Pit Site
Longswamp Township
Berks County, Pennsylvania

Statement of Basis and Purpose

This decision document presents the selected final remedial action for the Berks Sand Pit Site in Berks County Pennsylvania, developed in accordance with the Comprehensive Environmental Response, Compensation Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 and to the extent practicable, the National Contingency Plan. This decision is based on the administrative record for this site. The attached index identifies the items that comprise the administrative record upon which the selection of the remedial action is based. The Commonwealth of Pennsylvania has concurred in the selected remedy.

Description of the Selected Remedy

This remedy will address all the contaminants of concern at the Berks Sand Pit Site and will be considered the final remedy after implementation and operations of the groundwater treatment system. The remedy will include:

- excavation of contaminated sediments and offsite treatment and disposal by incineration
- installation and operation of a groundwater extraction system to remove contaminants from the aquifer
- construction and operation of an air stripper with vapor phase carbon absorption and the discharge of the treated water to the aquifer by injection wells.
- construction of an alternate water supply system
- chemical and biological monitoring of the surface and ground water quality
- local restrictions to prevent any further drinking water wells in the contaminated areas of the aquifer

Declaration

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate for this remedial action, and is cost effective. This remedy satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable..

9-29-88
Date

Stanley L. Laskowski
Acting Regional Administrator

THE DECISION SUMMARY

Site Location and Description

The Berks Sand Pit site is located in Longswamp Township, Berks County, Pennsylvania (Figure 1). The site is approximately 15 miles northeast of Reading, near the Villages of Huffs Church, Seisholtzville and Mertztown. The area of the site investigation is approximately 3 to 4 acres and there are at least 20 single homes within the investigation area. The actual sand pit was located on one of the residential lots where a home is now built. Figure two shows a sketch Berks Sand Pit Site and the area of the former sand pit.

The Berks Sand Pit originally was created by the removal of sand and gravel from the area. The size of the pit was approximately 100 feet in diameter and 30 feet deep. The pit reportedly was used by area residents for refuse disposal. Industrial waste also was alleged to have been disposed of in the area around the pit. Houses were constructed and private wells installed at this location beginning in 1978, after the pit was backfilled. In fact one home was built directly on top of the pit. During January 1982, groundwater contamination was detected in the area by the residents, and despite emergency actions taken by EPA, no pocket of contamination or burried drums of liquid solvents were discovered even though the pit was partially excavated and backfilled with clean fill.

Currently, two important land uses near the site are agricultural and residential development. Fields and orchards are located nearby in Longswamp Township, as well as in neighboring Hereford and District Townships. The site and the property in the immediate vicinity of the site is zoned as "R-2", which denotes a low density, residential district.

Groundwater contamination persists to this day, and is the major health threat at this site. The predominant organic contaminants at the site are 1,1,1-trichlorethane and 1,1-dichloroethene. These substances are used as indicators of other organic compounds at the site. The groundwater contamination does present a threat to drinking water at the site for residential wells downgradient from the contaminant plume.

The main recreational use of the land in Longswamp Township is fishing and hunting. The Berks Sand Pit area is drained by the headwaters of three creeks: West Branch of Perkiomen Creek, Perkiomen Creek and Swabia Creek. These creeks are all classified for cold water fishes and trout stocking. Ring-necked pheasants are the most abundant small game species in Berks County, while cottontail rabbits are the second most abundant. White-tailed deer also are plentiful. In addition to the hunting and fishing in Berks County, approximately four miles northeast of the site is the Doe Mountain skiing and Recreation Area in Lehigh County.

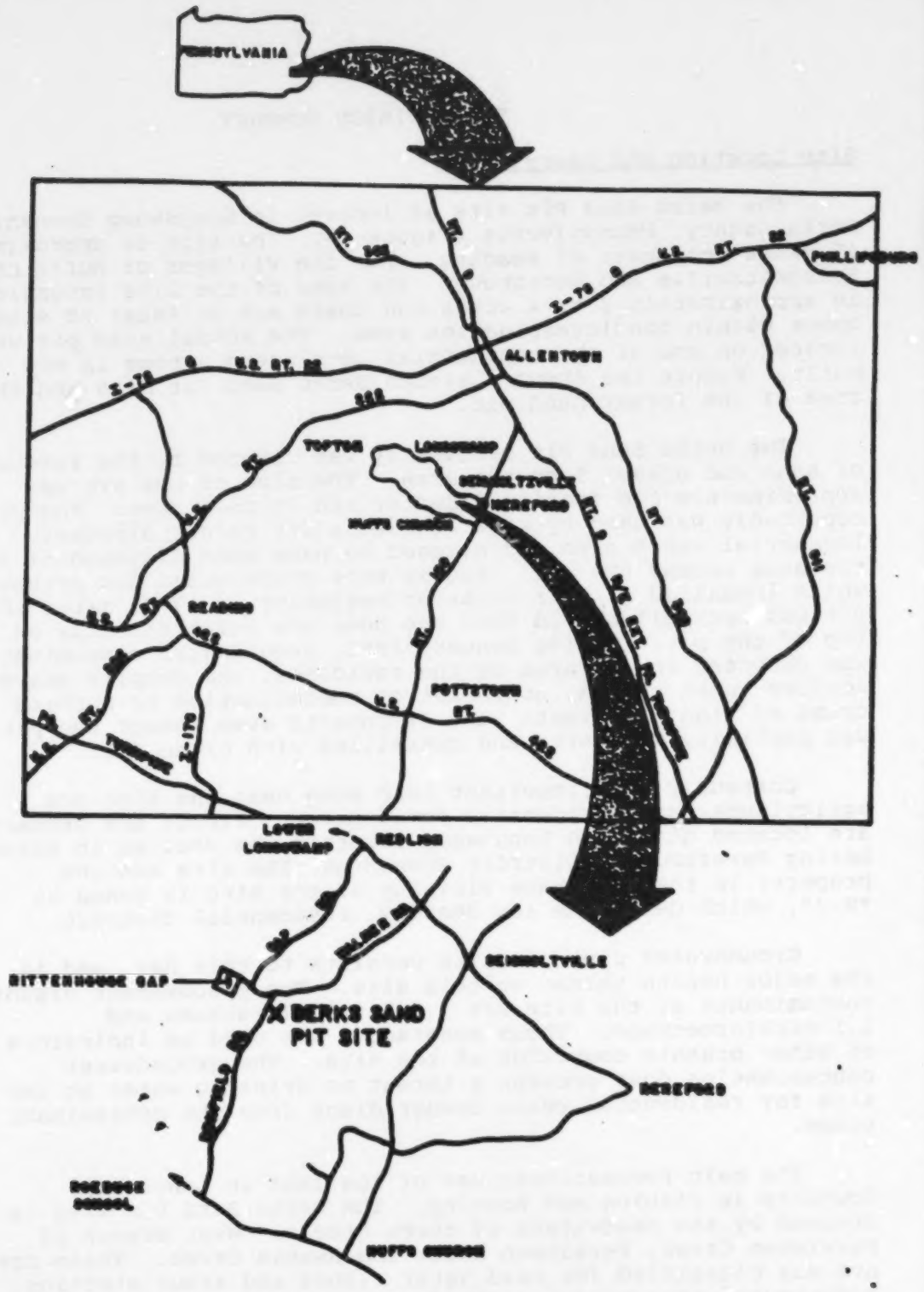

FIGURE 1

BERKS SAND PIT SITE
PROJECT LOCATION MAP

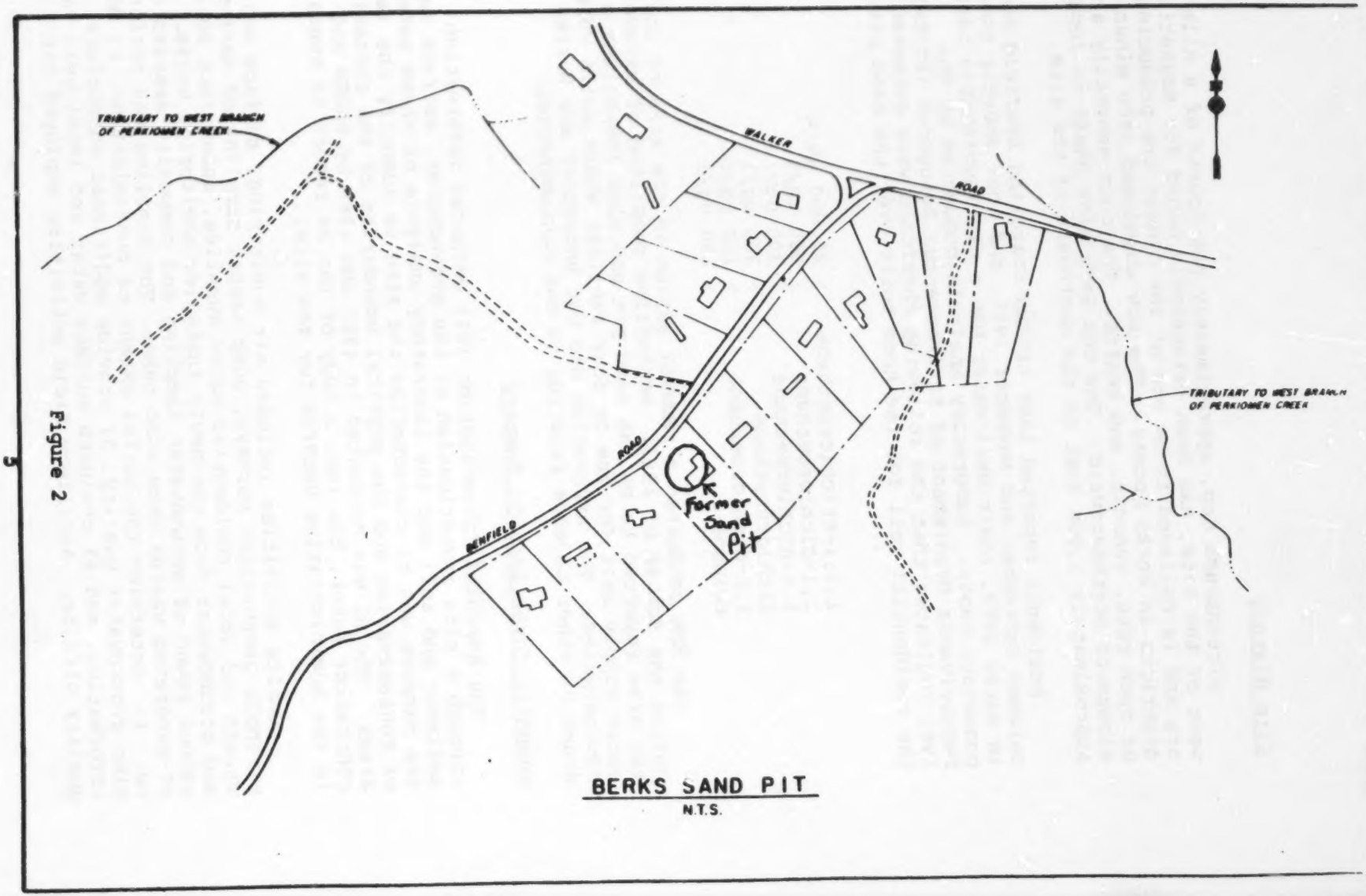

Figure 2

BERKS SAND PIT

N.T.S.

Site History

Rittenhouse Gap, approximately one-fourth of a mile northwest of the site, has been extensively mined for magnetite iron ore and is believed to be one of the oldest ore-producing districts in Berks County. The now abandoned iron mines consisted of open cuts, tunnels, and shafts. The cuts generally are elongated northeastward. The Cha Gery mine shaft is located approximately 1,000 feet to the northwest of the site.

Residents reported tank trucks traveling Benfield Road between September and November 1981, and that shortly thereafter, in early 1982, their well water had a distinguishable odor and obnoxious taste. Laboratory analysis conducted by The Pennsylvania Department of Environmental Resources (PADER) in 1982 indicated that the following chemicals were detected in the residential well for the home built over the sand pit:

1,1,1-trichloroethane	> 45,000 ug/l
1,1-dichloroethene	> 800 ug/l
1,1-dichloroethane	> 300 ug/l
dichloromethane	> 300 ug/l
1,2-dichloroethane	> 150 ug/l
toluene	> 150 ug/l

The EPA conducted a removal action in the area of the pit during the summer of 1983. Activities consisted of excavating the area reported to be the sand pit and also installing a water supply well for use by four families whose wells were contaminated. The excavation did not encounter any buried drums or other objects relating to the contamination.

Remedial Investigation Summary

The Remedial Investigation (RI) gathered information through a site investigation of the groundwater, surface water, sediment and soil and the laboratory analysis of these materials. The purpose was to characterize the site to identify the level of contamination and the physical boundaries of the contaminated areas. The RI was conducted in 1987 and 1988 by PADER and its contractor Baker, TSA Inc. A copy of the RI report is contained in the Administrative Records for the site.

Onsite activities included air monitoring, surface and borehole geophysical surveys, pump tests, sampling of surface waters and local residential water supplies, subsurface soils, and groundwater from the newly installed monitoring wells. A second round of groundwater sampling and composite samples of RI-generated wastes were also taken. The sampling was performed to: 1) determine the aerial extent of contamination, 2) determine groundwater quality, 3) provide additional subsurface information, and 4) evaluate surface water and local well water quality offsite. Ancillary field activities employed for

the RI included site surveying and mapping, in order to provide a current map of the site, and air monitoring to determine levels of respiratory protection requirements for the site. An outline of the activities conducted by the RI are highlighted below. The results of the RI are discussed in subsequent sections.

May 1987 - Site Reconnaissance

1. Air Quality Monitoring
2. Soil Gas Survey
3. Residential Wells

Fall 1987 - Groundwater Sampling Round

1. Air Quality Monitoring
2. Surface Water
3. Subsurface Soil Samples
4. Groundwater Monitoring Well Samples (Deep)

Winter 1988 - Second Sampling Round

1. Air Quality Monitoring
2. Surface Water
3. Groundwater Monitoring Well (Deep)
4. Groundwater Monitoring Well (Shallow)
5. Residential Wells
6. Water Supply Wells

Geology

The Berks Sand Pit is located in the Reading Prong Section of the New England Physiographic Province. Precambrain aged metamorphosed igneous, sedimentary and volcanic rocks comprise the highlands of the Reading Prong; the intermontane valleys are comprise of Cambro-Ordovician sediments consisting of limestone, dolomite, marble, and quartzite. Disseminated magnetite, and Cornwall-type magnetite deposits occur throughout the Reading Prong.

Magnetite ore is present near the surface west of the site, at the Cha Gery Mine, and north of the site, at Rittenhouse Gap. Magnetite rich pegmatites and massive magnetite was observed in three boreholes.

In the vicinity of the site the saprolite consists of a light brown, tan to orange clay with some silt and sand, and quartz and feldspar fragments. The saprolite changes to clay and sand with quartz and weathered granitic gneiss fragments at depth. Some local zones in the saprolite show evidence of foliation and relict structures.

The granitic gneiss is moderately to very closely fractured. Many fractures encountered in the boreholes contained chlorite filling and/or hematite staining on the fracture surfaces.

Extensively weathered zones (possibly weathered fracture zones) were observed the maximum expected depth of significant fracture zones and weathered fractures, as determined from the cross-hole seismic velocity measurements, is approximately 150 to 200 feet below the ground surface.

The granitic gneiss is highly weathered throughout the area and the thickness of the weathered overburden is quite variable. There is, in general, no distinct boundary between the overburden and the weathered bedrock. Rather, there is a gradual change from saprolite to weathered granitic gneiss to fresh granitic gneiss.

Hydrology

Groundwater in the Berks Sand Pit area is encountered in both the soil overburden and in the bedrock. The bedrock, a granitic gneiss, has a low primary porosity and permeability but has a significant secondary porosity and permeability due to the presence of a complex fracture system.

In general, the fractures and fractured zones provide preferred avenues for groundwater movement; more specifically, highly weathered and altered fracture zones tend to provide preferred avenues for groundwater movement. Other avenues for groundwater movement as indicated by the borehole visual and geophysical logs include faults, mineralogical changes and grain size changes.

Two groundwater flow regimes have been identified at the site. A shallow flow regime occurs in the overburden and a deep flow regime occurs in the fractured bedrock. The shallow flow regime consists primarily of saprolite and highly weathered bedrock. Water in this shallow aquifer may occur as perched zones, generally above saprolitic layers, and under confined to semi-confined conditions, generally beneath saprolitic layers.

The amount of water that moves through the bedrock depends on the hydraulic gradient and the hydraulic conductivity of the fractures and their frequency of occurrence and orientation. The hydraulic conductivity of the fractures depends on such properties as dimension, interconnectedness, filling material, etc. These properties are quite variable and as a result, a highly complex flow field has developed at the site.

In general, there are a large number of interconnected fractures oriented in both a northeasterly and northwesterly direction. From plots of the extent of contamination it can be seen that the northeasterly flow direction is dominant.

Nature and Extent of Contamination

This section describes the types of contaminants found at the site and their distribution in the soil, surface sediment, surface water and groundwater. The most serious threat to public health and the environment identified is the introduction of organic solvents into the groundwater through the disposal of an unknown quantity of liquid wastes at the site. A second exposure pathway of concern is groundwater discharge to surface seeps and streams resulting in the contamination of surface water.

The result of the sampling performed during the RI showed four volatile organic compounds that pose a risk to human health and/or the environment. The four constituents that were identified as indicator parameters are:

* 1,1-dichloroethene
* 1,1-dichloroethane
* 1,1,1-trichloroethane
* tetrachloroethene

These chemicals pose the greatest potential public health risk at the site and were chosen because they represent the chemicals which were the most toxic, mobile and in the highest concentrations. The following sections describe the extent of these contaminants in the various media at the Berks Sand Pit Site.

Soil

Soil samples were taken during the drilling program from several borings. None of the four indicator parameters identified above were detected in the soils at the Berks Sand Pit Site. The maximum depth of soil sampling was less than 20 feet. No significant contamination was detected in the soils at the site.

Surface Sediments

Surface sediments were collected during November 1987. The sediments were collected to determine the possibility of chronic surface waste contamination. Ten of 28 samples collected showed some type of volatile or semi-volatile compound. The location of the surface sediment sampling points is given in Figure 3.

However, only one sediment sample, SP-2, showed detectable levels of 1,1-dichloroethane at 240 ug/kg. The occurrence of this compound in SP-2 indicates the possibility of chronic contamination of the seeps east of the former sand pit. The source of this contamination may be the accumulation of contaminants from the groundwater over the past several years. It should be noted that 1,1-dichloroethane is a possible degradation product of 1,1,1-trichloroethane. Surface sediment remediation is part of the recommended alternative.

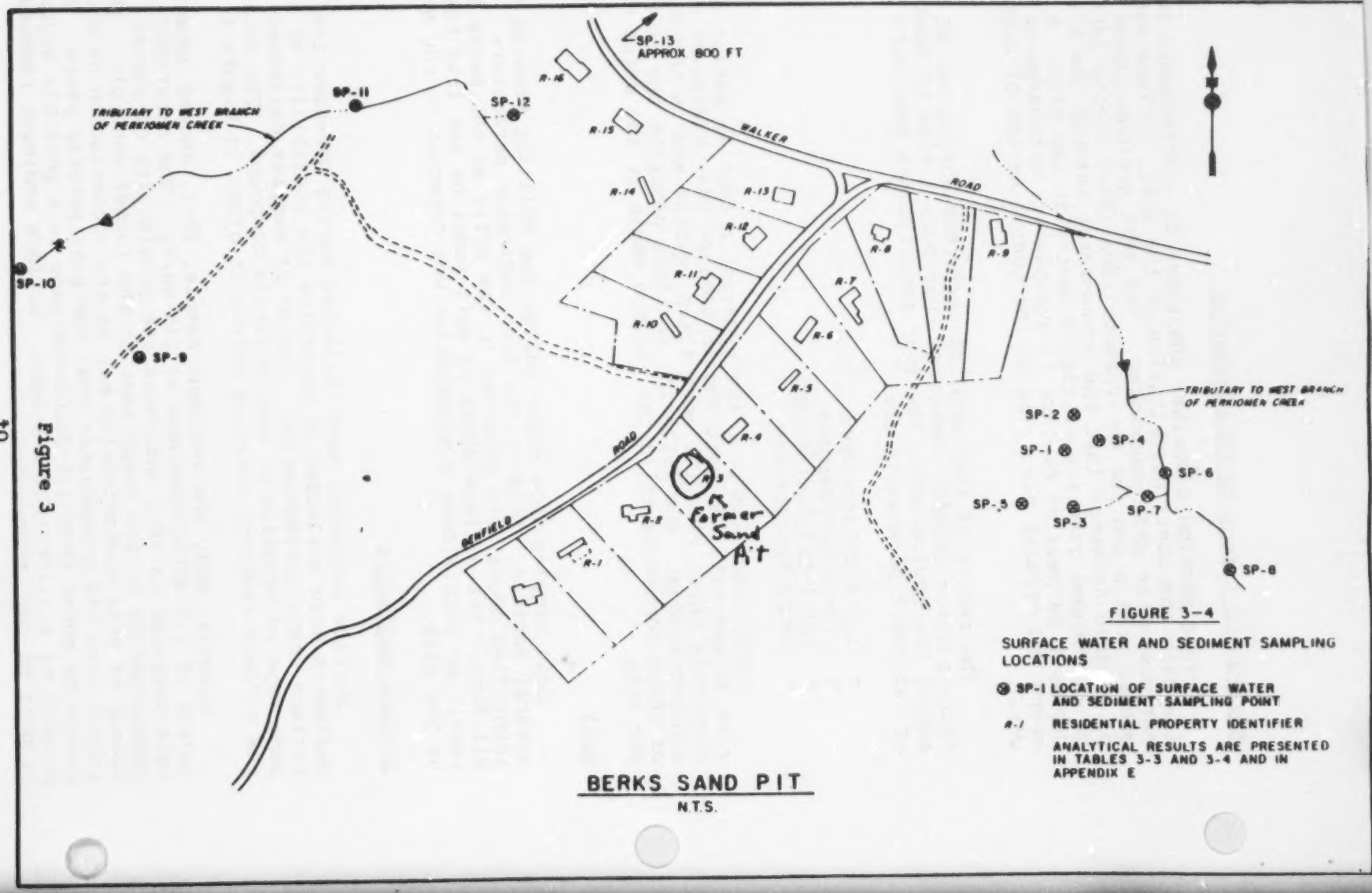

FIGURE 3-4

SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS

⊗ SP-1 LOCATION OF SURFACE WATER AND SEDIMENT SAMPLING POINT

R-1 RESIDENTIAL PROPERTY IDENTIFIER

ANALYTICAL RESULTS ARE PRESENTED IN TABLES 3-3 AND 3-4 AND IN APPENDIX E

BERKS SAND PIT

N.T.S.

Figure 3

10

Surface Water

Surface water samples were collected at 12 sampling points in November, 1987 and at 13 sampling points in March, 1988. The locations of these sampling points are given in Figure 3. For both rounds, three of the four indicator parameters were detected: 1,1-dichloroethane, 1,1-dichloroethene, and 1,1,1-trichloroethane. These result are given in Table 1 . Some elevated metals also were encountered in samples SP-2 and SP-5.

The results of these analyses indicate that some contamination by 1,1-dichloroethene, 1,1-dichloroethane and 1,1,1-trichloroethane occurs in all of the surface water samples except SP-12 and SP-13. The highest levels of contamination are in the seeps east of the former sand pit (see Figure 3). This contamination is probably the result of the discharge of contaminated groundwater to surface waters. The downstream extent of the surface water contamination by volatile organic compounds has not been determined. Further sampling of the surface waters is part of the recommended decision. The detection of the elevated metals in SP-2 and SP-5 appears to be an isolated occurrence; the source of these metals has not been determined.

In summary, the surface waters northeast of the former sand pit exhibit the most significant contamination. The presence of volatile organic compounds (VOCs) in site surface water is believed to be related to localized discharge of contaminated shallow groundwaters. Groundwater remediation should prevent further discharge at these surface seeps. The metals are thought to be derived from scattered surface dumping of scrap metals which is prevalent in this area. The surface water west and northwest of the site show very low levels of VOCs.

TABLE 1
SUMMARY OF ANALYTICAL RESULTS FOR SURFACE WATER SAMPLES TAKEN IN NOVEMBER 1987

Chemical	SP-3	SP-4	SP-7
1,1-dichloroethene	19.00	38.00	17.00
1,1-dichloroethane	*	*	*
1,1,1-trichloroethane	64.00	120.00	62.00
tetrachloroethene	ND	ND	ND

ND - Not detected.
*Data did not pass QA/QC procedures.
All units in ug/l.

Note: All other surface water samples taken in November 1987 showed detectable levels of at least one of the four indicator parameters. However, the analytical results for these samples did not pass the QA/QC procedures. SP-13 was not sampled because it was frozen.

Groundwater

Groundwater samples were collected from May 1987 to March 1988. These samples can be divided into three categories: residential well samples, monitoring well samples and packer test samples. The residential wells were sampled in two rounds: November 1987 and January 1988 through March 1988. The packer test samples were taken in October 1987.

Thirty-eight constituents were detected in the groundwater: eight VOCs, six semi-volatile compounds (SVOCs) and 14 inorganics. Only the extent of the four primary indicator chemicals, 1,1,1-trichloroethane, 1,1-dichloroethane, 1,1-dichloroethene, and tetrachloroethene will be discussed in detail since they exhibit the greatest risk to the community and the environment. No metals were detected above the National Primary Drinking Water Standards (NPDWS) in the groundwater.

Residential Well Samples

Two rounds of water samples were taken from the residential wells in May 1987 and in January 1988 through March 1988. The location of these wells are shown in Figure 4. Eleven residential wells were sampled during the first sampling round (May 1987). As shown in Table 2 five had detectable levels of at least one of the four indicator parameters. Only RW-4 was above the Maximum Containment Levels (MCLs) established by EPA for drinking water for both 1,1,1-trichloroethane and 1,1-dichloroethene.

Nineteen residential wells were sampled during the second round (January to March 1988). As shown in Table 3, six had detectable levels of at least one of the four indicator parameters. RW-2 exceeded the MCL for 1,1-dichloroethene and RW-3 exceeded the MCL for 1,1,1-trichloroethane. Five additional residential wells (RW-4, RW-5, RW-7, RW-9 and RW-10) showed detectable levels of at least one of the indicator parameters. However, data for these wells did not pass QA/QC procedures.

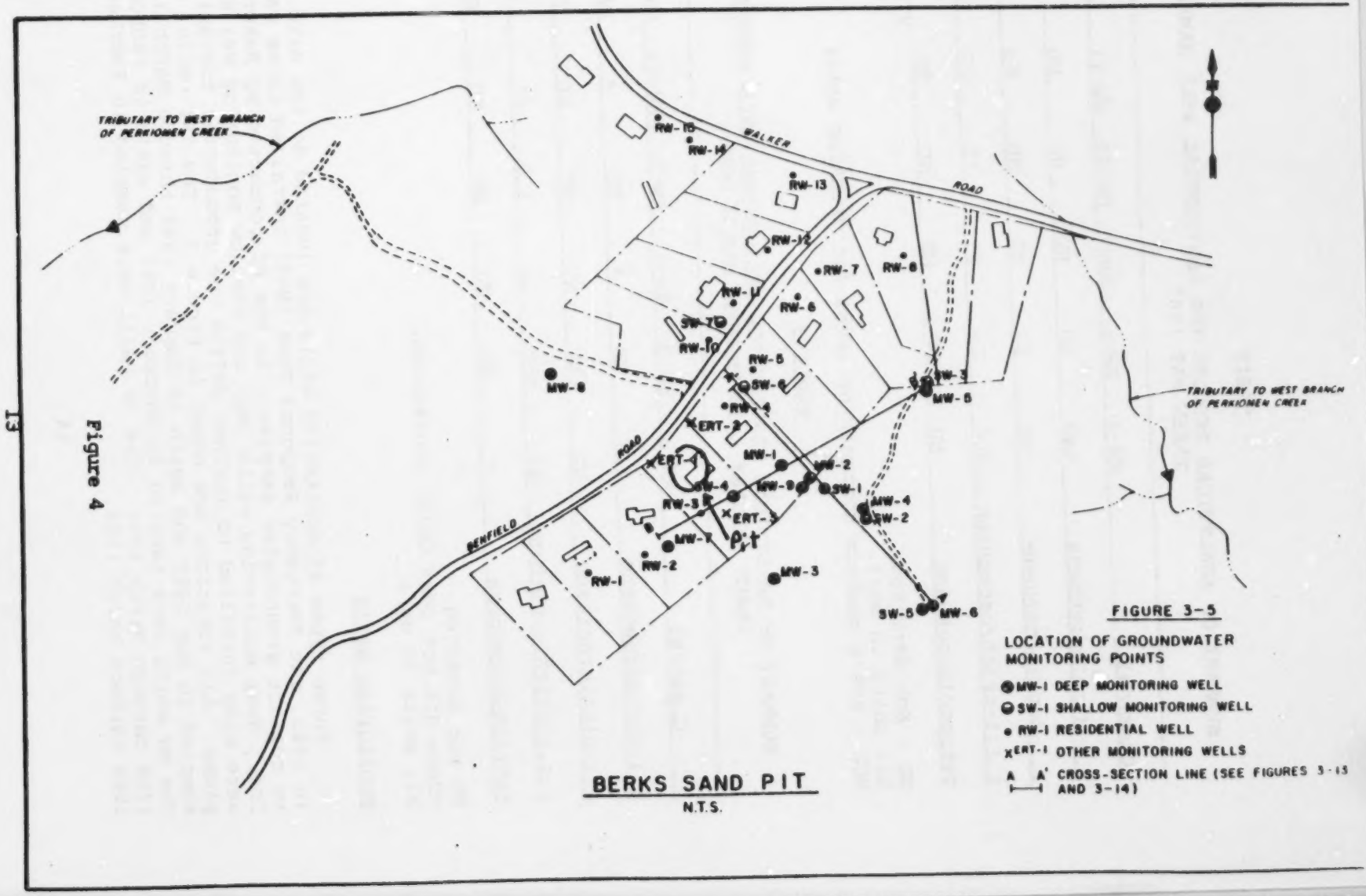
TRIBUTARY TO WEST BRANCH OF PERKIOMEN CREEK
WALKER ROAD
RW-15
RW-14
RW-13
RW-12
RW-7
RW-8
RW-11
RW-6
SW-7
RW-10
RW-5
SW-6
RW-4
MW-8
MW-5
SW-3
TRIBUTARY TO WEST BRANCH OF PERKIOMEN CREEK
ERT-2
ERT-1
MW-1
MW-2
SW-4
MW-9
SW-1
MW-4
RW-3
SW-2
ERT-3
MW-7
RW-2
RW-1
MW-3
SW-5
MW-6
ROAD
BENFIELD
N
BERKS SAND PIT
N.T.S.
FIGURE 3-5
LOCATION OF GROUNDWATER MONITORING POINTS
MW-1 DEEP MONITORING WELL
SW-1 SHALLOW MONITORING WELL
RW-1 RESIDENTIAL WELL
ERT-1 OTHER MONITORING WELLS
A A' CROSS-SECTION LINE (SEE FIGURES 3-13 AND 3-14)

Figure 4

TABLE 2

SUMMARY OF ANALYTICAL RESULTS FOR RESIDENTIAL WELL SAMPLES
TAKEN MAY 1987

Chemical	RW-4	RW-6	RW-7	RW-10	RW-11	MCL
1,1-dichloroethene	540	ND	ND	ND	ND	7
1,1-dichloroethane	ND	ND	ND	ND	ND	-
1,1,1-trichloroethene	6,800	13	21	12	27	200
Tetrachloroethene	ND	ND	ND	ND	ND	-

ND - Not detected.
All units in ug/l.
MCL - EPA's maximum contaminant level for drinking water

TABLE 3

SUMMARY OF ANALYTICAL RESULTS FOR RESIDENTIAL WELL SAMPLES
TAKEN JANUARY 1988 THROUGH MARCH 1988

Chemical	RW-2	RW-3	RW-6	RW-8	RW-11	RW-12
1,1-dichloroethene	8.7	ND	*	ND	*	ND
1,1-dichloroethane	ND	ND	ND	ND	ND	ND
1,1,1-trichloroethane	47	1,400	16	6.5	21	6.1
Tetrachloroethene	*	ND	ND	ND	ND	ND

ND-Not detected.
*Data did not pass QA/QC procedures.
All units in ug/l.

Monitoring Wells

Three types of monitoring wells are located at the site. In 1983, the Emergency Response Team (ERT) installed three wells to collect groundwater samples. In the RI conducted by Baker/TSA, Inc., deep monitoring wells (MW) and shallow monitoring wells (SW) were also installed to further define the groundwater contamination plume. All locations are shown in Figure 4. The ERT wells were sampled in May 1987 and again in January 1988 through March 1988. The MW wells were sampled in November 1987 and again in February 1988 through March 1988. The SW wells were sampled in February 1988 through March 1988.

For the May 1987 sampling of the ERT wells, all three wells had detectable levels of 1,1,1-trichloroethane, as shown in Table 4. 1,1,1-trichloroethane also was detected for the January through March 1988 sampling round. Water samples from the 1988 sampling round also contained 1,1-dichloroethene and tetrachloroethene. These concentrations are shown in Table 4.

The MW monitoring wells were sampled in November 1987 and again in February 1988 through March 1988. The analytical results for the 1987 sampling round did not pass QA/QC procedures and will not be discussed here. For the February 1988 through March 1988 sampling round, at least one of the indicator parameters was detected in all of the MW wells as shown in Table 5. 1,1-dichloroethene was detected in all of the MW monitoring wells above the MCL of 7 ug/l. 1,1,1-trichloroethane was detected in MW-3 through MW-9 above the MCL of 200 ug/l. Additionally, tetrachloroethene was detected in MW-7 at a concentration of 25 ug/l.

The SW monitoring wells were sampled in February 1988 through March 1988. As shown in Table 6, wells SW-1 through SW-5 exceed the respective MCLs for 1,1-dichloroethene and 1,1,1-trichloroethane. The analytical results for SW-6 did not pass the QA/QC procedures.

Packer Tests

Water samples were taken during the packer tests in October 1987 to give an indication of the vertical extent of contamination. These samples were analyzed for both volatile and semivolatile organic compounds. Only one packer test sample passed the QA/QC procedures: MW-2 at the 44 to 54 foot depth. This sample showed a 1,1,1-trichloroethane concentration of 19 ug/l.

TABLE 4

SUMMARY OF ANALYTICAL RESULTS FOR ERT MONITORING WELL
SAMPLES TAKEN MAY 1987 AND JANUARY 1988 THROUGH MARCH 1988

Chemical	ERT-1 (1987)	ERT-2 (1987)	ERT-3 (1987)	ERT-1 (1988)	ERT-2 (1988)	ERT-3 (1988)	MCL
1,1-dichloroethene	ND	ND	*	250.00	*	250.00	7
1,1-dichloroethane	ND	ND	*	ND	ND	ND	-
1,1,1-trichloroethane	5.00	19.00	2,900.00	98.00	26.00	98.00	200
Tetrachloroethene	ND	ND	ND	ND	ND	6.40	-

ND - Not detected.
*Data did not pass QA/QC procedures.
All units in ug/l.
MCL - Maximum Contaminant Level.

TABLE 5

SUMMARY OF ANALYTICAL RESULTS FOR DEEP MONITORING WELL SAMPLES
TAKEN JANUARY THROUGH MARCH 1988

Chemical	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9
1,1-dichloroethene	48	48	860	3,500	120	340	1,300	41	1,100
1,1-dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-trichloroethane	180	90.00	2,200	7,300	300	940	3,700	*	3,100
Tetrachloroethane	ND	ND	*	*	ND	ND	25.00	ND	*

ND-Not detected.
*Data did not pass QA/QC procedures.

TABLE 6

SUMMARY OF ANALYTICAL RESULTS FOR SHALLOW MONITORING WELL SAMPLES
TAKEN JANUARY THROUGH MARCH 1988

Chemical	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7
1,1-dichloroethene	850	220	100	270	280	*	ND
1,1-dichloroethane	ND	ND	ND	ND	ND	ND	ND
1,1,1-trichloroethane	1,900	6,500	240	490	600	*	ND
Tetrachloroethene	ND	*	ND	*	ND	ND	ND

ND - Not detected.
*Data did not pass QA/QC procedures.
All units in ug/l

A review of the historical data, as shown in the RI, indicates that although the contamination at the site has decreased somewhat over the past five years (1983 to 1988), it is still present in significant quantities. The decrease in concentration is probably best illustrated by the historical 1,1,1-trichloroethane concentrations recorded for RW-2, RW-3 and ERT-3. The data shows some large fluctuations in 1,1,1-trichloroethane concentrations over relatively short (months) periods of time. Some downgradient residential wells (RW-6, RW-7 and RW-11) also show slightly increasing 1,1,1-trichloroethane concentrations. These time-concentration relationships indicate that the contaminant plume (1,1,1trichloroethane) is migrating, dispersing and become more dilute with time. The remedial action selected in this Record of Decision address the groundwater contamination and the public health threat by extracting contaminated ground water and removing the organic chemicals and will prevent any further migration of the contaminant plume.

The contaminant plume is elongated in an east-northeasterly direction and is centered around MW-4 with a maximum concentration of 7,310 ug/l of 1,1,1-trichloroethane and 3,500 ug/l of 1,1-dichloroethene. Higher concentrations extend from the R-2 property as far as the tributary to the West Branch of Perkiomen Creek. Lower levels of contamination appear to extend north and northwest of the east-northeast plume axis towards Benfield and Walker Roads. The area of contamination, both high and low, potentially extends into residential properties R-2 through R-12. The contamination appears to have sunk and are being carried to deeper depths within the aquifer by vertical gradients. The maximum depth of contamination, based on the geophysical investigation and the packer tests, is thought to be 250 to 300 feet below the surface.

Public Health Evaluation and Environmental Concerns

The groundwater at the Berks Sand Pit Site has a significant potential adverse health impact on receptor populations. There were two complete exposure pathways identified in the RI. One pathway is the groundwater exposure via inhalation, ingestion, and dermal contact by receptors on residential wells, and the other is the surface water/sediment exposure pathway from the seepage of groundwater to the surface.

The air pathway is not a health hazard in regard to the volatilization of organics from the surface waters, from the surface soils or from the groundwater exposure pathway. In addition, the surface soils are not a health hazard from dermal contact or ingestion.

The groundwater exposure pathway had significant chronic health index values and projected risks values above the target risk values for carcinogens. The compounds most responsible for the potential adverse health impact were 1,1-dichloroethene and 1,1,1-trichloroethane.

The residential wells having levels of these two compounds of concern were RW-2, RW-3 and RW-4. The monitoring wells also showed concentrations capable of having a potential adverse health effect. The migration of the plume toward the northeast could bring the elevated concentrations found in the monitoring wells to human receptors.

The surface water and sediment exposure pathway is not a significant chronic health risk for human receptors but is directly in line with the migrating plume and further defines the extent of contamination. These surface water and sediments indicate a potential for the contaminants to affect aquatic life and the environment. Removal of the contaminated sediments and subsequent monitoring should help to determine the effectiveness of the groundwater extraction system.

Community Relations

The Community Relations Plan for this site was developed by the Pennsylvania Department of Environmental Resources and has been implemented over the past two years. All site related documents and the Administrative Record have been placed in the Longswamp Township Municipal Building. The public notice of EPA's proposed plan, which included the preferred remedial action alternative, was published on August 30, 1988. A thirty day public comment period began from that dated and ended on September 28,1988. A formal public meeting was held on September 12, 1988 at the Township Building to discuss the proposed plan. The transcript from that meeting represents the only comments received by EPA and PADER. All questions and comments presented at that meeting were addressed at that time. These are discussed in detail in the transcript which is attached.

In addition to the public participation in the remedy selection, local residents were continuously informed of the field activities and the occasions when residential wells were sampled.

Applicable, Relevant and Appropriate Requirements (ARARs)

The Remedial Action Alternative chosen for the Berks Sand Pit Site must meet all applicable or relevant and appropriate requirements (ARARs) in accordance with Section 121 of CERCLA, 42 U.S.C. Section 9621.

The primary regulatory considerations at the site apply to the treatment of groundwater. According to EPA's guidance for groundwater classification, this is a Class 1 aquifer which is currently in use. Therefore two contaminant specific levels for protection of human health must be met under the Safe Drinking Water Act (SDWA). 1,1,1-trichloroethane has a Maximum Contaminant Level (MCL) of 200 ug/l and 1,1-dichloroethene has an MCL of 7 ug/l (see 40 C.F.R. Section 141.12). These health based levels indicate the clean up standards for groundwater which the remedy must reach before clean up has been achieved. However, EPA and PADER will have to evaluate the effectiveness of the treatment system on a periodic basis to determine if these standards can be met or exceeded.

In addition to these contaminant level requirements, EPA and PADER must comply with all Federal Resource Conservation and Recovery Act (RCRA) requirements for onsite water treatment including air emissions site and offsite transportation, incineration and related air emissions. Also the State requirements would include the Pennsylvania Solid Waste Management Act (PSWMA), the Pennsylvania Clean Streams Law (PCSL), and the Pennsylvania Air Pollution Control Act (PAPCA). For the alternative proposing water discharge to surface streams the National Pollutant Discharge Elimination System (NPDES) requirements and PCSL must be met. Likewise for the proposals to reinject the treated groundwater, the Underground Injection Control (UIC) requirements must be met. The specific chemicals standards will be defined in the design specifications stage. Regulations for the selected remedial actions are further specified in the recommended alternative section.

Summary of Alternatives

Seven feasible Remedial Action Alternatives (RAAs) were developed to remedy the site conditions. The seven alternatives (RAA No. 1 through RRA No. 7) were developed to address four levels of cleanup as described below. A list of the seven alternatives and the cleanup categories they satisfy is provided below. A more detailed discussion of these RAAs contained in the Feasibility Study for the site.

Cleanup Category I: No Action

RAA No. 1 Continued monitoring of existing wells (groundwater) and surface water

RAA No. 2 Surface and groundwater monitoring, including the installation of additional monitoring wells

Cleanup Category II: Alternatives That Prevent A Risk Increase To Human Health

RAA No. 3 Surface and groundwater monitoring, including the installation of additional monitoring wells, and installation of an alternative water supply which will be defined in the design specification stage

Cleanup Category III: Alternatives That Meet Or Exceed ARARs for Human Health

RAA No. 4 Surface and groundwater monitoring, including the installation of additional monitoring wells, installation of an alternative water supply system which will be defined in the design specifications, groundwater extraction, groundwater treatment by air stripping with vapor phase carbon absorption, discharge of treated water to the watershed (stream), and excavation and disposal/treatment of contaminated sediments by landfarming or incineration

RAA No. 5 Surface and groundwater monitoring, including the installation of additional monitoring wells, installation of an alternative water supply system which will be defined in the design specifications, groundwater extraction, groundwater treatment by carbon adsorption, discharge of treated water to the watershed (stream), and excavation and disposal/treatment of contaminated sediments by landfarming or incineration

Cleanup Category IV: Alternatives That Meet Or Exceed ARARs For Human Health And The Environment

RAA No. 6 Surface and groundwater monitoring, including the installation of additional monitoring wells, installation of an alternative water supply system which will be defined in the design specifications, groundwater extraction, groundwater treatment by air stripping with vapor phase carbon absorption, discharge of treated water by reinjection into aquifer, excavation and disposal/treatment of contaminated sediments by landfarming or incineration

RAA No. 7 Surface and groundwater monitoring, including the installation of additional monitoring wells, installation of an alternate water supply system which will be defined in the design specifications, groundwater extraction, groundwater treatment by carbon adsorption, discharge of treated water by reinjection, excavation and disposal/treatment of contaminated sediments by landfarming or incineration

Table 7 provides a summary of the cost evaluation performed for the RAAs. All costs are presented in 1988 dollars.

Table 7
REMEDIAL ACTION ALTERNATIVES COST SUMMARY
BERKS SAND PIT SITE

RAA No.	Capital Cost ($1,000)	Annual O&M ($1,000)	Present Worth Cost ($1,000)
1	0	101.0	952.4
2	941.3	109.9	1,977.6
3	2,227.3	180.5	3,975.4
4	5,543.8	455.0	9,833.6
5	5,614.2	1,033.3	15,355.2
6	6,443.7	459.2	10,773.1
7	6,514.1	1,037.5	16,294.7

The following tables address the nine areas of concern which EPA considers for each RAA. Basically, there are two treatment alternatives (air stripping and carbon) and two disposal options (surface discharge and groundwater reinjection) for the water.

TABLE 8
BERKS SAND PIT
SUMMARY OF THE ALTERNATIVE EVALUATION

Alternative Number	ARAR Compliance	Toxicity, Mobility or Volume Reduction	Short-Term Effectiveness	Long-Term Acceptance and Performance
RAA 1 No Remedial Action	Does not comply with contaminant-specific ARARs	Does not reduce toxicity, mobility or volume	Does not reduce risks	Does not reduce risks
RAA 2 No Remedial Action with Groundwater Monitoring	Does not comply with contaminant specific ARARs	Does not reduce toxicity, mobility or volume	Does not reduce risks	Does not reduce risks
RAA 3 Alternative Water Supply with groundwater monitoring	Does not comply with contaminant-specific ARARs	Does not reduce toxicity, mobility or volume	Reduces only a portion of the health risks	Reduces only a portion of the health risks
RAA 4 (Air Stripping) Alternative Water Supply, Sediment and Groundwater Treatment, Disposal to Stream	Complies with known ARARs	Volume reduced, mobility reduced, toxicity reduced	Reduces risks to public health	Reduces a majority of the risks
RAA 5 Alternative Water Supply, Sediment and Groundwater Treatment, Carbon Adsorption, Stream Disposal	Complies with known ARARs	Volume reduced, Mobility reduced, Toxicity reduced	Reduces risks to public health	Reduces a majority of the risks

BERKS SAND PIT
SUMMARY OF THE ALTERNATIVE EVALUATIONS

	Implementability	Community Acceptance	State Acceptance	Present Worth Cost	Protection of Human Health
1.	Easily implementable	Probably unacceptable	Probably unacceptable	952	Nonprotective
2.	Easily implementable	Probably unacceptable	Probably unacceptable	1,978	Nonprotective
3.	Easily implementable	Favorable acceptance	Favorable acceptance	3,975	Partially protective
4.	Implementable	Generally favorable acceptance	Favorable acceptance	9,834	Generally protective
5.	Implementable	Generally favorable acceptance	Favorable acceptance	15,355	Generally protective

BERKS SAND PIT
SUMMARY OF THE ALTERNATIVE EVALUATIONS

Alternative Number	ARAR Compliance	Toxicity, Mobility or Volume Reduction	Short-Term Effectiveness	Long-Term Acceptance and Performance
RAA 6 Alternate Water Supply, Sediment and Groundwater Treatment, Air Stripping, Reinjection	Complies with known ARARs	Volume reduced, Mobility reduced, Toxicity reduced	Reduces risks to public health and environment	Reduces most of the risks
RAA 7 Alternate Water Supply, Sediment and Groundwater Treatment, Carbon Adsorption, Reinjection	Complies with Known ARARs	Volume reduced, Mobility reduced, Toxicity reduced	Reduces risks to public health and environment	Reduces most of the risks

BERKS SAND PIT
SUMMARY OF THE ALTERNATIVE EVALUATIONS

	Implementability	Community Acceptance	State Acceptance	Present Worth cost ($1,000)	Protection of Human Health and Environment
6.	Implementable	Favorable	Favorable	10,773	Protective
7.	Implementable	Favorable acceptance	Favorable acceptance	16,294	Protective

Recommended Alternative

After extensive technical review and cost evaluation, EPA and PADER have selected RAA No. 6 as the appropriate remedial action for the Berks Sand Pit Site.

RAA No. 6 includes:

- excavation of contaminated sediments and offsite treatment and disposal by incineration
- installation and operation of a groundwater extraction system to remove contaminants from the aquifer
- construction and operation of an air stripper with vapor phase carbon absorption and the discharge of the treated water to the aquifer by injection wells
- construction of an alternate water supply system
- chemical and biological monitoring of the surface and groundwater quality
- restrictions to prevent any further drinking water wells in the contaminated areas of the aquifer

Groundwater remediation targets must meet or exceed the Maximum Contaminant Level (MCL) for both 1,1,1-trichloroethane (200 ug/l) and 1,1-dichloroethene (7 ug/l) as required by the Safe Drinking Water Act. The groundwater contamination levels will be reduced by the extraction, treatment and reinjection of clean water. The facility must meet hazardous waste requirements of RCRA Subtitle C 40 C.F.R. Part 264 and the Pennsylvania Solid Waste Management Act. This remediation may require up to thirty years of operation, but will be periodically evaluated to determine the effectiveness and technical feasibility of reducing groundwater contamination by this method. Based on this evaluation, the Agencies will determine to continue the extraction and treatment program or to cease treatment when the aquifer no longer presents a potential health risk.

Secondary target levels, which will be used as guidelines, to determine when the groundwater is no longer a risk are based on published Unit Cancer Risk (UCR) information. 1,1-dichloroethene is a possible human carcinogen and tetrachloroethelene is a probable human carcinogen. The secondary target will be to decrease the concentration of these contaminants to below 1.0 ug/l which would approximate detection limits by standard EPA analysis.

The groundwater will be treated to levels established by the Underground Injection Control (UIC) regulations 40 C.F.R. Parts 144,145,146 and 147.

When a decision is made to discontinue the extraction and reinjection program a close out sequence will be initiated to decommission the wells and treatment facilities.

The alternative water supply source has not been resolved. Three options to be investigated in the design stage will include: extention of Mountain Village Community Water Supply, extention of Topton Public Supply, and a new well field with extention of the existing Longswamp Well Association. The local residents expressed a clear preference for the extention of the Topton Water Supply.

The contaminated sediments must also be excavated and sent to a permitted or interim status facility which is compliance with all hazardous waste requirements of RCRA Subtitle C 40 C.F.R. Part 264.

When comparing the remedial alternatives for this site, EPA was limited to RAAs 4, 5, 6 and 7 because these alternatives were the only ones which met ARARs. The Agency selected the air stripping treatment rather than the carbon absorption because they are equally effective at removing the groundwater contaminants and the air stripping is five million dollars less expensive than the carbon. Basically, replenishing the carbon is the major expense. The Agency also selected the reinjection alternative rather than surface water discharge because reinjection treatment requirements would be more stringent and reinjection may help to flush out the contaminated groundwater in a shorter period of time. Also there may be residences who would continue to use their private wells and reinjection would help to maintain the current level of the water table in the vicinity of the site. As shown in Table 8 the selected remedy reduces toxicity, mobility and volume of the contaminant plume by the extraction of the contaminated groundwater and treatment by air stripping. This alternative is protective of the public health and the environment and will provide a permanent remedy for the site.

Figure 5 shows the general process for RAA No. 6. Figure 6 shows the details of how an air stripper works and Figure 7 shows the new recovery and reinjection wells.

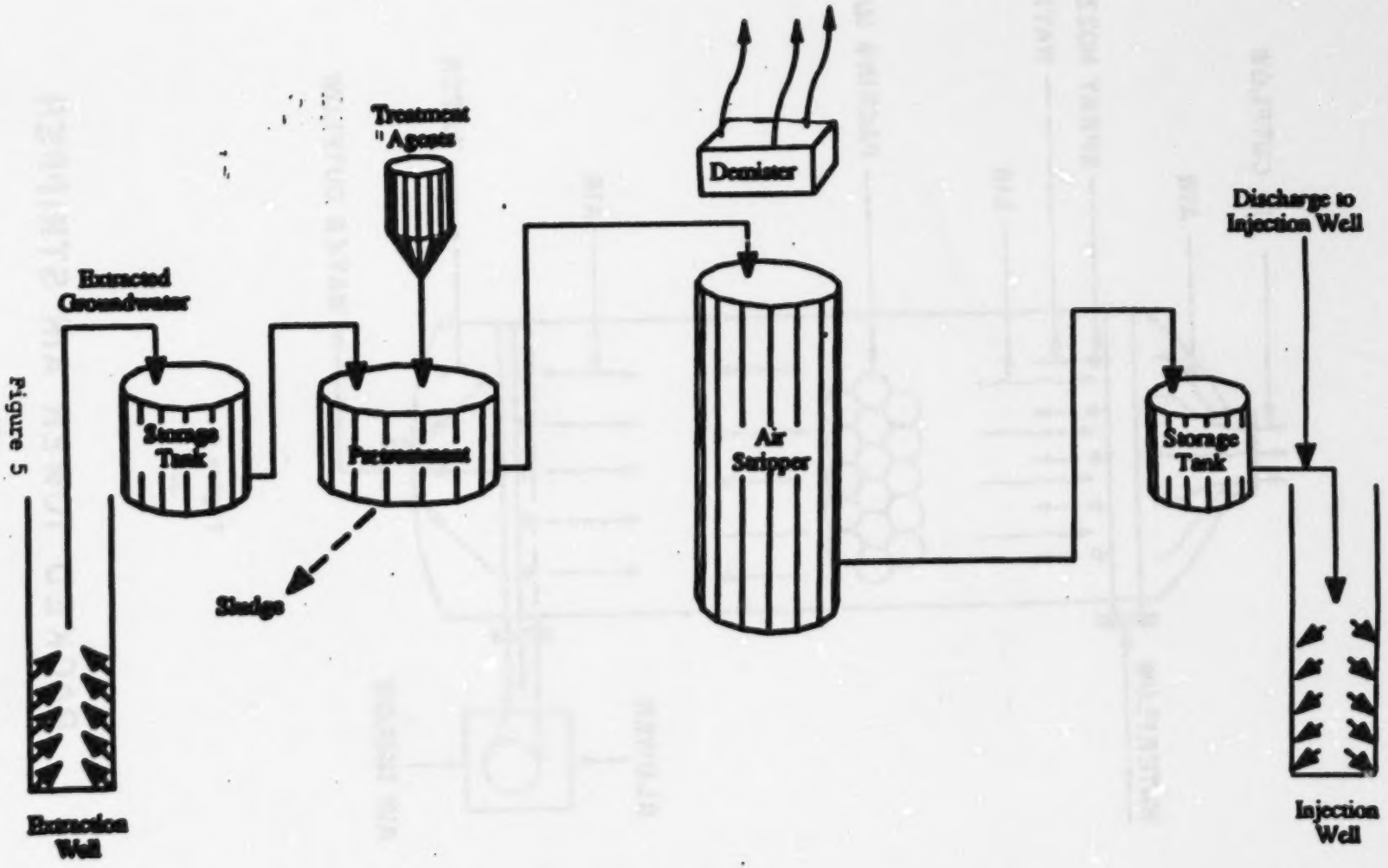

Figure 5
29

BERKS SAND PIT

GENERALIZED PROCESS DIAGRAM FOR RAA NO. 6

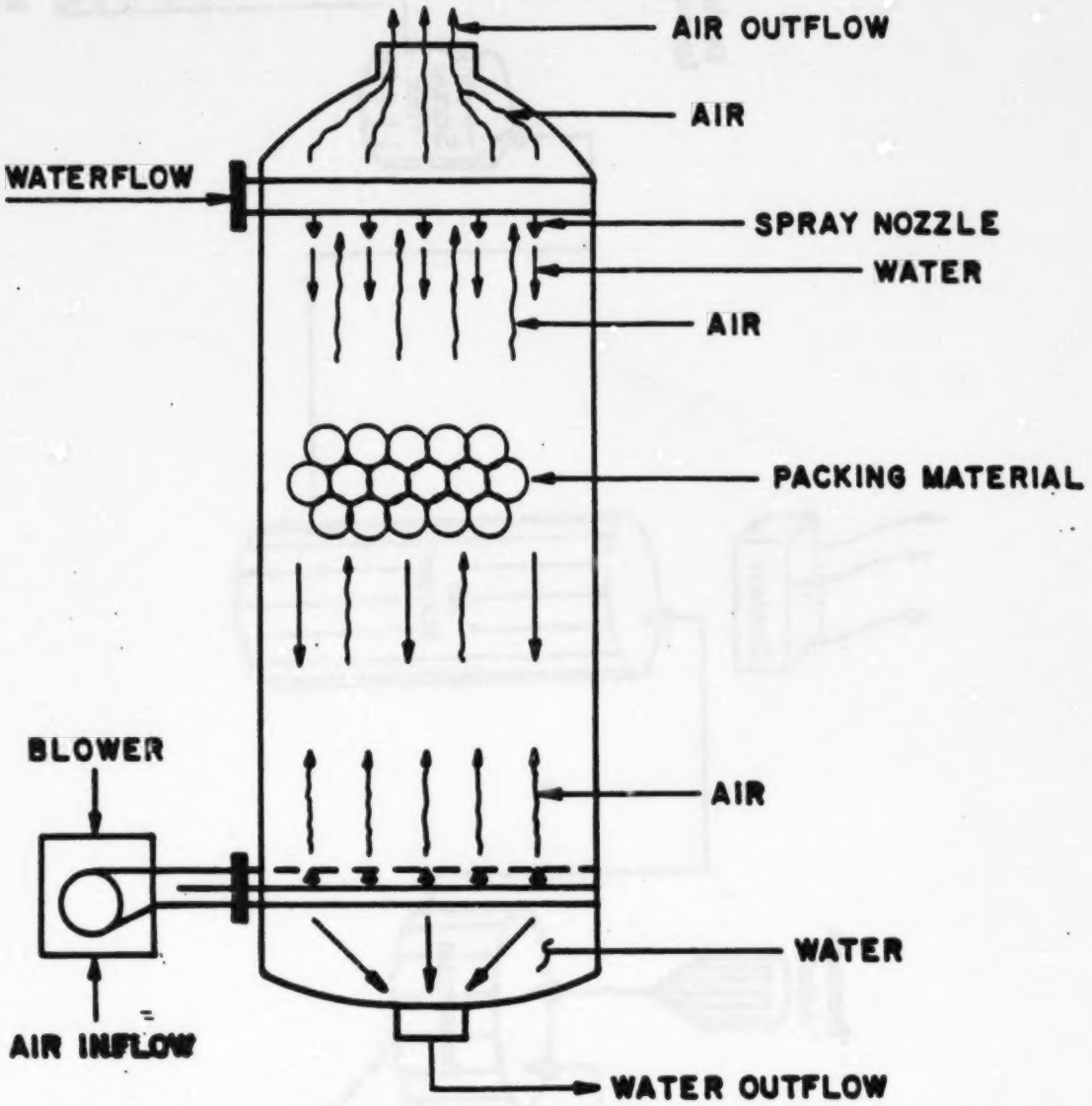

Figure 6

PACKED TOWER AIR STRIPPER

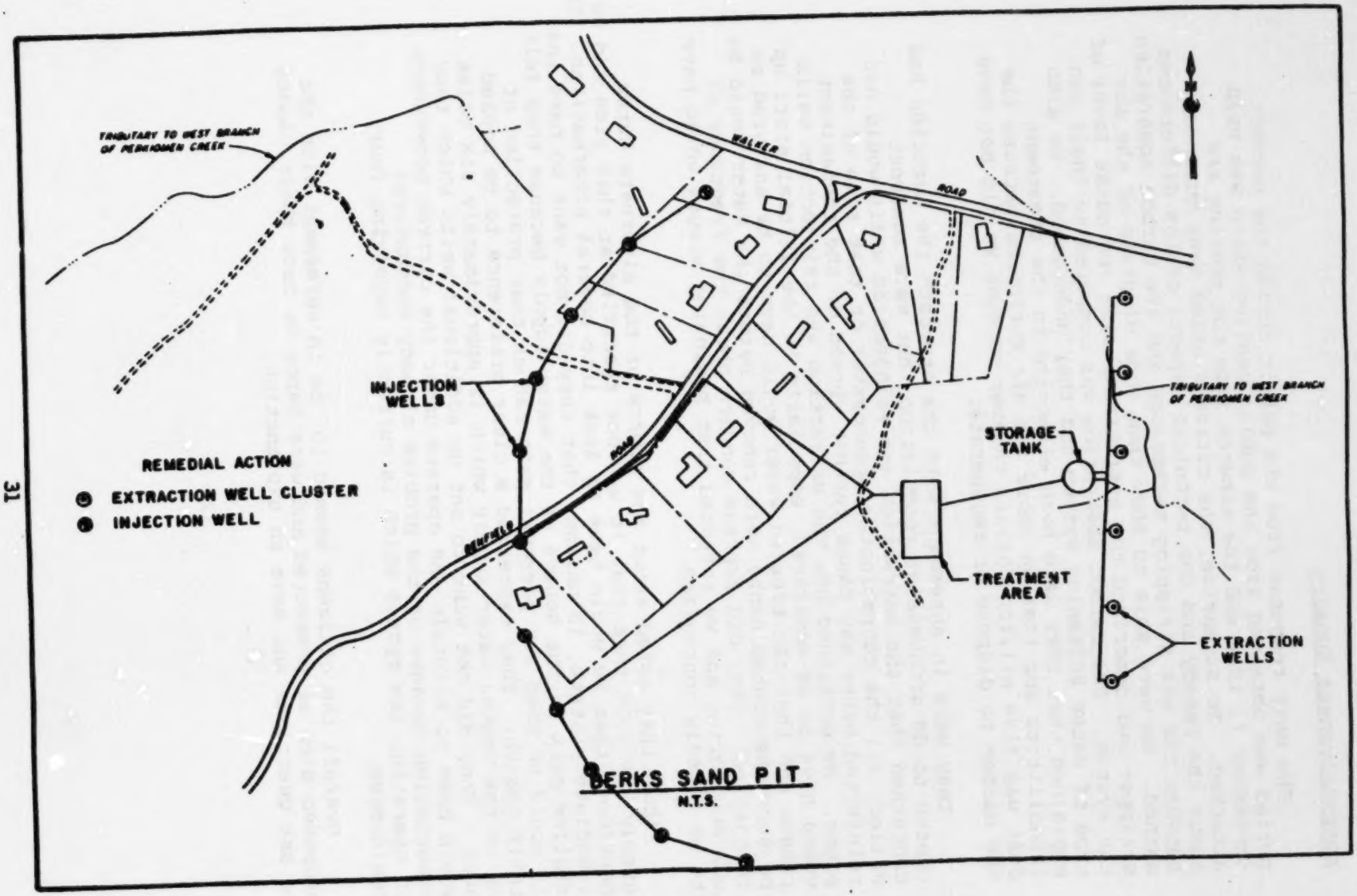

Figure 7

LOCATION OF EXTRACTION AND REINJECTION WELLS

Responsiveness Summary

The only response from the public during the comment period was obtained from the public meeting which was held September 7, 1988 and the minutes from the meeting are attached. To summarize, the citizens asked many questions about the remedy and the technical aspects of the differences between the air stripping technology and the carbon absorption method. We were able to show them some diagrams of the air stripper and described the approximate size and noise level of the system. The carbon absorption was compared to their own type of water softening system and they understood. We also explained that they were both effective in the treatment capabilities and that we chose the air stripping because the cost was five million dollars cheaper because we did not have the carbon to dispose or regenerate.

They were in agreement with the approach the Agencies had chosen to do groundwater remediation, but were somewhat concerned that the extraction and reinjection wells would not collect all the contaminated groundwater or that some of the reinjected water may cause further spread of the contaminant plume. We explained how the extraction and reinjection wells would have to be monitored, especially in the initial start up phases and that the treated water would have to be analyzed to be sure the contaminants were removed before the water could be reinjected. They did express concern about the frequency of our monitoring and we restated that beginning stages would have to be closely controlled.

When they asked about the source of the alternate water supply, we told them that it was not specified at this time and we mentioned that we would have to look into several alternatives. They immediately state, in unison, that they did not want to have the trailer park as the source of the water supply because they felt it would be used for personal gain rather that protection of their health. They expressed a clear preference to be hooked up to the Topton water supply which is approximately six miles away. They did not want to set up additional wells which they would have to maintain and operate under the current homeowners association because of the problem already encountered in operating the system which is currently supplying four residences.

Overall the citizens seemed to be in agreement with the proposed plan as presented and were happy to have their chance to ask questions and have an explanation.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
Post Office Box 2063
Harrisburg, Pennsylvania 17120

September 29, 1988

Deputy Secretary for
Environmental Protection

(717) 787-5028

Stephen R. Wassersug, Director
Hazardous Waste Management Division
EPA Region III
841 Chestnut Building
Philadelphia, PA 19107

Re: Letter of Concurrence
Berks Sand Pit Superfund Site, Record of Decision (ROD)

Dear Mr. Wassersug:

The Record of Decision for the Berks Sand Pit Superfund site has been reviewed by the Department.

The selected final remedial action will include the following:

* Excavation of contaminated sediments and off-site treatment and disposal by incineration.

* Installation and operation of a groundwater extraction system to remove contaminants from the aquifer.

* Construction and operation of an air stripper with vapor phase carbon absorption and the discharge of the treated water to the aquifer by injection wells.

* Construction of an alternate water supply system.

* Chemical and biological monitoring of the surface and groundwater quality.

* Local restrictions to prevent any further drinking water wells in the contaminated areas of the aquifer.

I hereby concur with the EPA's proposed remedy with the following conditions:

* The Department will be given the opportunity to concur with decisions related to the design of the remedial actions to assure compliance with State design specific ARARs.

* The Department will be given the opportunity to determine, with EPA, whether continued operation of the groundwater extraction and treatment system will reduce groundwater contamination to meet Federal and State ARARs and when to cease treatment as the aquifer no longer presents a potential health risk.

* The Department will be given the opportunity to concur with decisions related to the chemical and biological monitoring requirements for surface and groundwater quality.

* EPA will assure that the Department is provided an opportunity to fully participate in any negotiations with responsible parties.

* The Department will reserve our right and responsibility to take independent enforcement actions pursuant to State and Federal laws.

* This concurrence with the selected remedial action is not intended to provide any assurances pursuant to SARA Section 104(c)(3).

We recommend that the installation of the alternative public water supply proceed as quickly as possible and independently of the other remedial actions. Thank you for the opportunity to concur with this EPA Record of Decision. If you have any questions regarding this matter, please do not hesitate to contact me.

Sincerely,

Mark M. McClellan
Deputy Secretary
Environmental Protection